

# **MXI™-Express x4**

## **MXI-Express x4 Series User Manual**

*MXI-Express x4 Multisystem eXtension Interface for PCI Express, CompactPCI Express, and PXI Express Bus Systems*

*NI PCIe-8371*

*NI PCIe-8372*

*NI PXIe-8370*

*NI PXIe-8374*

## **Worldwide Technical Support and Product Information**

[ni.com](http://ni.com)

## **Worldwide Offices**

Visit [ni.com/niglobal](http://ni.com/niglobal) to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

## **National Instruments Corporate Headquarters**

11500 North Mopac Expressway Austin, Texas 78759-3504 USA Tel: 512 683 0100

For further support information, refer to the *Technical Support and Professional Services* appendix. To comment on National Instruments documentation, refer to the National Instruments Web site at [ni.com/info](http://ni.com/info) and enter the Info Code `feedback`.

# Important Information

---

## Warranty

The NI PCIe-8371/8372, NI PXIe-8370, and NI PXIe-8374 are warranted against defects in materials and workmanship for a period of one year from the date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The media on which you receive National Instruments software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace software media that do not execute programming instructions if National Instruments receives notice of such defects during the warranty period. National Instruments does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. National Instruments will pay the shipping costs of returning to the owner parts which are covered by warranty.

National Instruments believes that the information in this document is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, National Instruments reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult National Instruments if errors are suspected. In no event shall National Instruments be liable for any damages arising out of or related to this document or the information contained in it.

EXCEPT AS SPECIFIED HEREIN, NATIONAL INSTRUMENTS MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S RIGHT TO RECOVER DAMAGES CAUSED BY FAULT OR NEGLIGENCE ON THE PART OF NATIONAL INSTRUMENTS SHALL BE LIMITED TO THE AMOUNT THEREFORE PAID BY THE CUSTOMER. NATIONAL INSTRUMENTS WILL NOT BE LIABLE FOR DAMAGES RESULTING FROM LOSS OF DATA, PROFITS, USE OF PRODUCTS, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, EVEN IF ADVISED OF THE POSSIBILITY THEREOF. This limitation of the liability of National Instruments will apply regardless of the form of action, whether in contract or tort, including negligence. Any action against National Instruments must be brought within one year after the cause of action accrues. National Instruments shall not be liable for any delay in performance due to causes beyond its reasonable control. The warranty provided herein does not cover damages, defects, malfunctions, or service failures caused by owner's failure to follow the National Instruments installation, operation, or maintenance instructions; owner's modification of the product; owner's abuse, misuse, or negligent acts; and power failure or surges, fire, flood, accident, actions of third parties, or other events outside reasonable control.

## Copyright

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying, recording, storing in an information retrieval system, or translating, in whole or in part, without the prior written consent of National Instruments Corporation.

National Instruments respects the intellectual property of others, and we ask our users to do the same. NI software is protected by copyright and other intellectual property laws. Where NI software may be used to reproduce software or other materials belonging to others, you may use NI software only to reproduce materials that you may reproduce in accordance with the terms of any applicable license or other legal restriction.

## Trademarks

LabVIEW, National Instruments, NI, ni.com, the National Instruments corporate logo, and the Eagle logo are trademarks of National Instruments Corporation. Refer to the *Trademark Information* at [ni.com/trademarks](http://ni.com/trademarks) for other National Instruments trademarks.

Other product and company names mentioned herein are trademarks or trade names of their respective companies.

Members of the National Instruments Alliance Partner Program are business entities independent from National Instruments and have no agency, partnership, or joint-venture relationship with National Instruments.

## Patents

For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at [ni.com/patents](http://ni.com/patents).

## Export Compliance Information

Refer to the *Export Compliance Information* at [ni.com/legal/export-compliance](http://ni.com/legal/export-compliance) for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.

## WARNING REGARDING USE OF NATIONAL INSTRUMENTS PRODUCTS

(1) NATIONAL INSTRUMENTS PRODUCTS ARE NOT DESIGNED WITH COMPONENTS AND TESTING FOR A LEVEL OF RELIABILITY SUITABLE FOR USE IN OR IN CONNECTION WITH SURGICAL IMPLANTS OR AS CRITICAL COMPONENTS IN ANY LIFE SUPPORT SYSTEMS WHOSE FAILURE TO PERFORM CAN REASONABLY BE EXPECTED TO CAUSE SIGNIFICANT INJURY TO A HUMAN.

(2) IN ANY APPLICATION, INCLUDING THE ABOVE, RELIABILITY OF OPERATION OF THE SOFTWARE PRODUCTS CAN BE IMPAIRED BY ADVERSE FACTORS, INCLUDING BUT NOT LIMITED TO FLUCTUATIONS IN ELECTRICAL POWER SUPPLY, COMPUTER HARDWARE MALFUNCTIONS, COMPUTER OPERATING SYSTEM SOFTWARE FITNESS, FITNESS OF COMPILERS AND DEVELOPMENT SOFTWARE USED TO DEVELOP AN APPLICATION, INSTALLATION ERRORS, SOFTWARE AND HARDWARE COMPATIBILITY PROBLEMS, MALFUNCTIONS OR FAILURES OF ELECTRONIC MONITORING OR CONTROL DEVICES, TRANSIENT FAILURES OF ELECTRONIC SYSTEMS (HARDWARE AND/OR SOFTWARE), UNANTICIPATED USES OR MISUSES, OR ERRORS ON THE PART OF THE USER OR APPLICATIONS DESIGNER (ADVERSE FACTORS SUCH AS THESE ARE HEREAFTER COLLECTIVELY TERMED "SYSTEM FAILURES"). ANY APPLICATION WHERE A SYSTEM FAILURE WOULD CREATE A RISK OF HARM TO PROPERTY OR PERSONS (INCLUDING THE RISK OF BODILY INJURY AND DEATH) SHOULD NOT BE RELIANT SOLELY UPON ONE FORM OF ELECTRONIC SYSTEM DUE TO THE RISK OF SYSTEM FAILURE. TO AVOID DAMAGE, INJURY, OR DEATH, THE USER OR APPLICATION DESIGNER MUST TAKE REASONABLY PRUDENT STEPS TO PROTECT AGAINST SYSTEM FAILURES, INCLUDING BUT NOT LIMITED TO BACK-UP OR SHUT DOWN MECHANISMS. BECAUSE EACH END-USER SYSTEM IS CUSTOMIZED AND DIFFERS FROM NATIONAL INSTRUMENTS' TESTING PLATFORMS AND BECAUSE A USER OR APPLICATION DESIGNER MAY USE NATIONAL INSTRUMENTS PRODUCTS IN COMBINATION WITH OTHER PRODUCTS IN A MANNER NOT EVALUATED OR CONTEMPLATED BY NATIONAL INSTRUMENTS, THE USER OR APPLICATION DESIGNER IS ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY OF NATIONAL INSTRUMENTS PRODUCTS WHENEVER NATIONAL INSTRUMENTS PRODUCTS ARE INCORPORATED IN A SYSTEM OR APPLICATION, INCLUDING, WITHOUT LIMITATION, THE APPROPRIATE DESIGN, PROCESS AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION.

# Electromagnetic Compatibility Guidelines

---

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) as stated in the product specifications. These requirements and limits are designed to provide reasonable protection against harmful interference when the product is operated in its intended operational electromagnetic environment. There is no guarantee that interference will not occur in a particular installation. To minimize the potential for the product to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

The following statements contain important information needed before installing and using this product:



**Caution** This product is intended for use in industrial locations. As a result, this product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.



**Caution** Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the hardware under the local regulatory rules.



**Caution** For EMC compliance, operate this device with shielded cables and accessories.

# Contents

---

## About This Manual

|                            |      |
|----------------------------|------|
| Products Covered .....     | vii  |
| Related Documentation..... | vii  |
| Conventions .....          | viii |

## Chapter 1

### Introduction

|                                     |     |
|-------------------------------------|-----|
| Description and Features .....      | 1-1 |
| Functional Overview.....            | 1-2 |
| Functional Block Diagrams.....      | 1-3 |
| Basic MXI-Express x4 System.....    | 1-5 |
| Larger MXI-Express x4 Systems ..... | 1-6 |

## Chapter 2

### Getting Started

|   |     |
|---|-----|
| Terminology.....  | 2-1 |
| Connecting a PC to an Expansion Chassis .....             | 2-2 |
| Using a MXI-Express x4 Copper Cable.....                  | 2-2 |
| Equipment Needed .....                                    | 2-2 |
| Connecting Additional Expansion Chassis to a System ..... | 2-3 |
| Using a MXI-Express x4 Copper Cable.....                  | 2-3 |
| Equipment Needed .....                                    | 2-3 |

## Chapter 3

### Installation and Configuration

|  |      |
|--|------|
| Unpacking.....   | 3-1  |
| Hardware Installation.....   | 3-2  |
| Installing an NI PCIe-8371/8372.....                                   | 3-2  |
| Installing the Low-Profile Bracket on the NI PCIe-8371 (Optional)..... | 3-3  |
| Installing an NI PXIe-8370 or NI PXIe-8374 .....                       | 3-5  |
| Cabling .....  | 3-7  |
| Powering On the MXI-Express x4 System .....                            | 3-7  |
| Powering Off the MXI-Express x4 System.....                            | 3-8  |
| LED Indicators.....  | 3-9  |
| Software Installation and Configuration.....                           | 3-12 |
| Installation.....  | 3-12 |
| Configuring Your System.....   | 3-12 |

**Appendix A  
Common Questions**

**Appendix B  
Specifications**

**Appendix C  
Legacy Specifications**

**Appendix D  
Technical Support and Professional Services**

**Glossary**

**Index**

# About This Manual

---

This manual describes the features, functions, and operation of the NI PCIe-8371/8372, NI PXIe-8370, and NI PXIe-8374 MXI-Express x4 series of products.

## Products Covered

---



**Note** The model numbers listed below are followed by their specific NI assembly numbers in parentheses. Ensure the specifications of interest match the NI assembly number that is printed on either the front or back side of the board.

- [NI PCIe-8371 \(199994x-01L\)](#)
- [NI PCIe-8372 \(194591x-01L\)](#)
- [NI PXIe-8370 \(194402x-02\)](#)
- [NI PXIe-8374 \(193970x-02L\)](#)



**Note** *x* denotes all letter revisions of the assembly.

The list of boards above are the latest generation of MXI-Express x4 products. For specifications on previous generations of these products, refer to Appendix C, *Legacy Specifications*.

- [NI PCIe-8371 \(194591x-02\)](#)<sup>1</sup>
- [NI PCIe-8372 \(194591x-01\)](#)<sup>1</sup>

## Related Documentation

---

The following documents contain information that you might find helpful as you read this manual:

- *Set Up Your MXI-Express (x4) for PXI Express System*
- Your computer or chassis documentation
- *PXI Express Hardware Specification*, Revision 1.0
- *PXI-2 PXI Software Specification*, Revision 2.1
- *PXI-6 PXI Express Software Specification*

---

<sup>1</sup> No longer available for purchase.

- *PCI Specification*, Revision 2.3
- *PCI-PCI Bridge Architecture Specification*, Revision 1.1
- *PICMG CompactPCI Express EXP.0 R1.0 Specification*
- *PCI Express Specification*, Revision 1.0a and 1.1
- *PCI Express External Cabling 1.0 Specification*

## Conventions

---

The following conventions appear in this manual:

»

The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **Options»Settings»General** directs you to pull down the **Options** menu, select the **Settings** item, and select **General** from the last dialog box.



This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

**bold**

Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

CompactPCI Express/  
CPCIe

The terms *CompactPCI Express* and *CPCIe* are interchangeable in this manual.

*italic*

Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.

monospace

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

PCI Express/PCIe

The terms *PCI Express* and *PCIe* are interchangeable in this manual.

PXI Express chassis

In this manual, whenever a PXI Express chassis is referenced, a CompactPCI Express chassis could be used instead.

PXI Express/PXIe

The terms *PXI Express* and *PXIe* are interchangeable in this manual.



# Introduction

## Description and Features

MXI-Express x4 uses PCI Express signals over a cable of up to 7 m with PCI Express-to-PCI Express switches. You can do the following with MXI-Express x4:

- Control a PXI Express or CompactPCI Express backplane with a PCI Express-based PC
- Physically separate the measurement or automation system from a host PC
- Control multiple PXI Express or CompactPCI Express chassis with a single PCI Express-based PC or PXI Express embedded controller.

Table 1-1 lists the products and lists their features for comparison.

**Table 1-1.** Feature Comparison of Available MXI-Express x4 Interfaces

| Model        | Slot Type              | Number of Ports | Cable Support         |
|--------------|------------------------|-----------------|-----------------------|
| NI PCIe-8371 | PCI Express x4         | 1               | MXI-Express x4 Copper |
| NI PCIe-8372 | PCI Express x4         | 2               | MXI-Express x4 Copper |
| NI PXIe-8370 | PXI Express Controller | 1               | MXI-Express x4 Copper |
| NI PXIe-8374 | PXI Express Peripheral | 1               | MXI-Express x4 Copper |



**Note** There are other products not listed in Table 1-1 that support MXI-Express x4 connectivity such as the HDD-826x series of products. For installation instructions and other information concerning these products, refer to their respective manuals.

# Functional Overview

---

MXI-Express x4 is based on PCI Express technology. A MXI-Express x4 kit uses PCI Express switches to enable control of a PXI Express or CompactPCI Express chassis from a PC with an available PCI Express slot, or from a PXI Express chassis with an available PXI Express slot. The switch architecture is transparent to device drivers, so no additional software is needed for CompactPCI Express level support for PXI Express devices in connected chassis.



**Note** For full PXI/PXI Express functionality such as chassis and controller identification, trigger routing, and slot detection, install the PXI Platform Services software included with your kit. This software also can be found at [ni.com/updates](http://ni.com/updates) by searching for **PXI Platform Services**.

The link between the PC and the chassis is a x4 cabled PCI Express link. This link is a dual-simplex communication channel comprised of four low-voltage, differentially driven signal pairs. The link can transmit at a rate of 10 Gbps in each direction simultaneously.



**Note** This port is compatible with the cabled PCI Express specification developed by the PCI-SIG.

The BIOS of some host machines may not support the extension of the PCI-Express fabric or PCI bus. Since this is the primary function of MXI-Express x4 products, those systems may not boot or function correctly. To address this issue, certain MXI-Express x4 products have additional functionality intended to hide all PCI or PCI-Express resources that are connected to the host machine, and allow NI MXI-Express BIOS Compatibility Software to handle the enumeration process of these resources instead of the BIOS.

In the cases where this software is required, there may be a dip switch on the board that needs to be toggled as instructed by the documentation for the software. The functional block diagrams in this chapter illustrate the locations and availability of the dip switch package. Only the first dip switch in the package is used for this purpose. The other switches serve no function and should be left in their default position<sup>1</sup>.

---

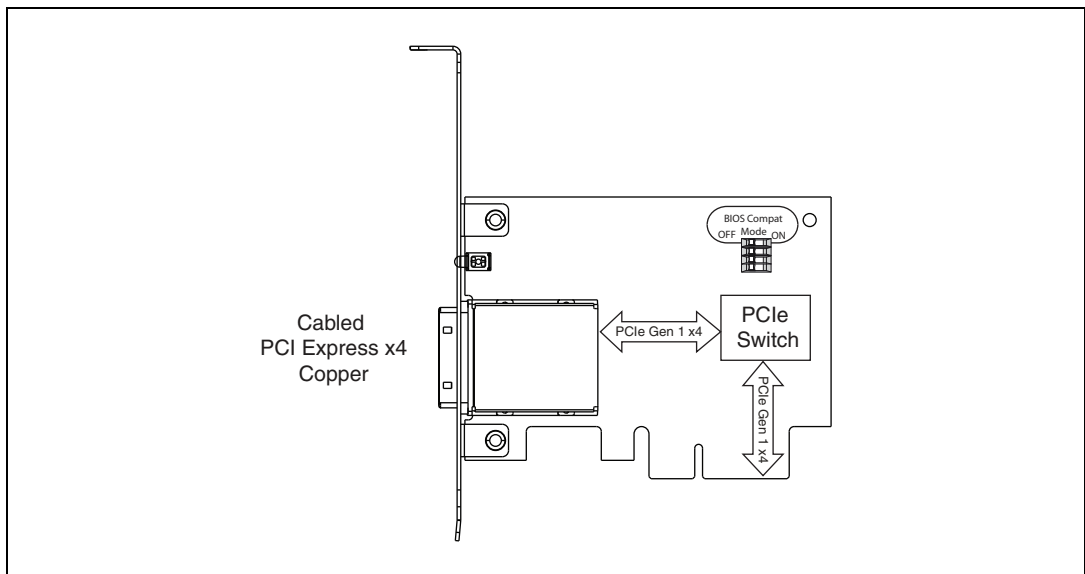
<sup>1</sup> On certain legacy MXI-Express x4 products that contain the dip switch package, the secondary switches may serve a reserved purpose.



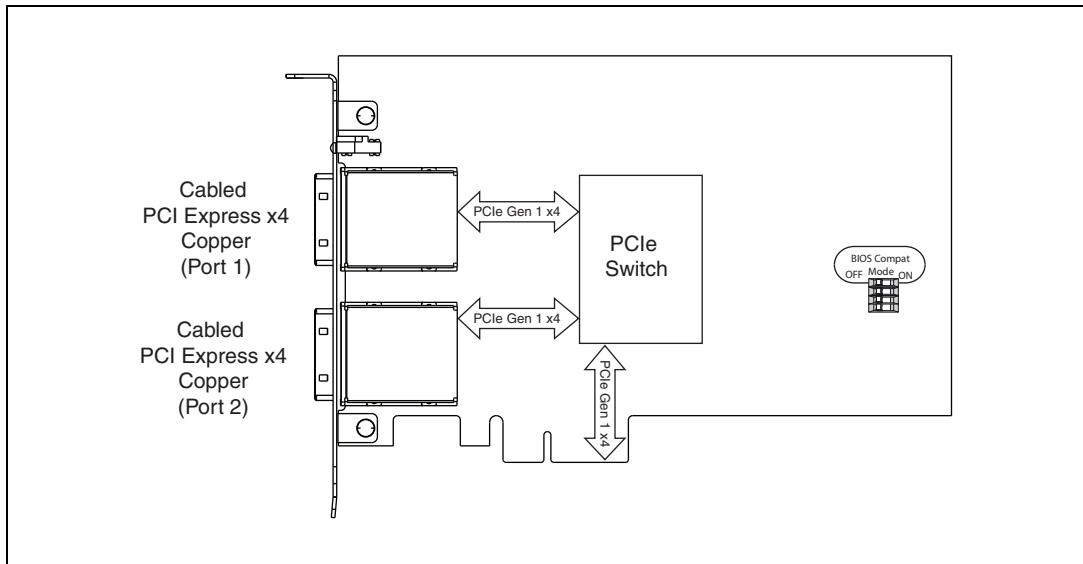
**Note** Unless NI MXI-Express BIOS Compatibility Software is installed on the host machine for use, the BIOS Compat Mode dip switch (switch 1) should remain in the off position. If this mode is enabled on a MXI-Express x4 product in a host machine that does not have the software installed, the connected devices will not be detected by the operating system.

For more information on host system compatibility with MXI-Express x4 products, refer to the NI Developer Zone document *Tips to Help You Successfully Use MXI-Express Controllers* at [ni.com/zone](http://ni.com/zone).

## Functional Block Diagrams



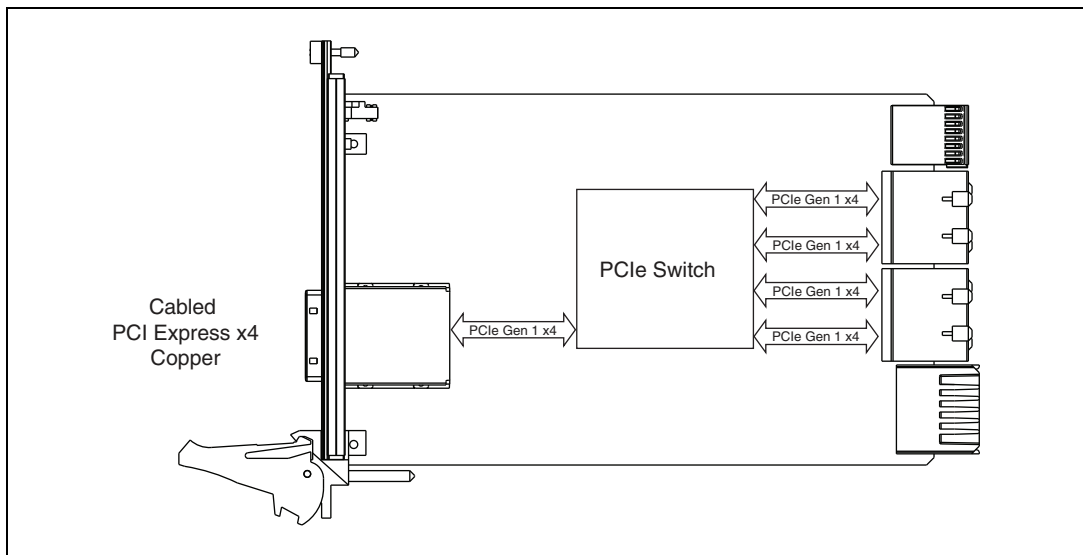
**Figure 1-1.** NI PCIe-8371 (199994x-01L) Block Diagram



**Figure 1-2.** NI PCIe-8372 (194591x-01L) Block Diagram



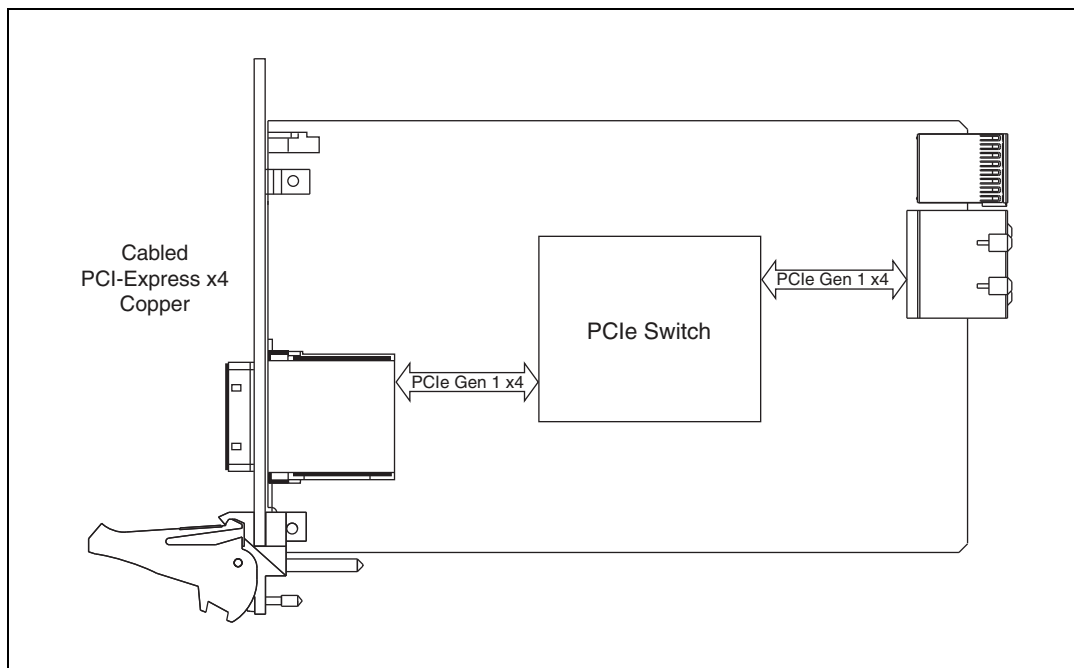
**Note** For optimal performance, use port 2.



**Figure 1-3.** NI PXIe-8370 (194402x-02) Block Diagram



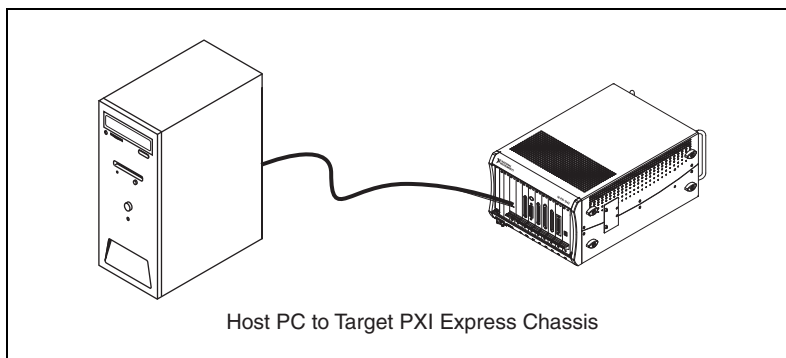
**Note** The NI PXIe-8370 also supports dual link mode, which will convert the links to the chassis backplane into two Gen 1 x8 links instead of four Gen 1 x4 links.



**Figure 1-4.** NI PXIe-8374 (193970x-02L) Block Diagram

## Basic MXI-Express x4 System

The simplest MXI-Express x4 system consists of an NI PCIe-8371/8372 in a PC connected to an NI PXIe-8370 in the controller slot of a PXI Express chassis, as shown in Figure 1-5.



**Figure 1-5.** Example of a Basic MXI-Express x4 Link Topology



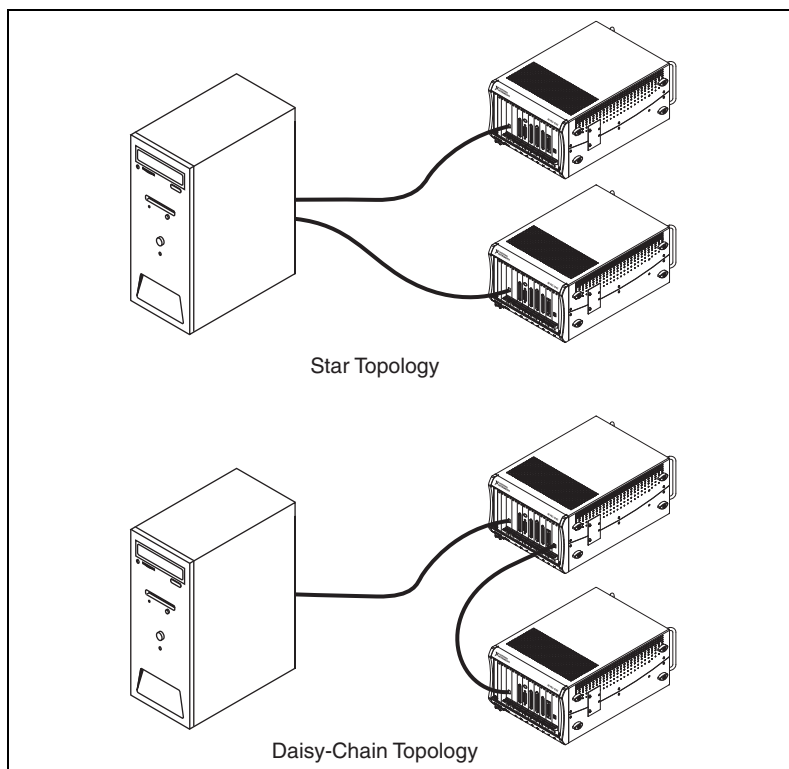
**Note** In this manual, whenever a PXI Express chassis is referenced, a CompactPCI Express chassis could be used instead.

## Larger MXI-Express x4 Systems

The NI PCIe-8372 has two MXI-Express x4 connectors, allowing one NI PCIe-8372 to host two different NI PXIe-8370 cards in separate PXI Express or CompactPCI Express chassis. If multiple PCI Express slots are available in the host PC, additional PXI Express chassis can be connected by installing an additional NI PCIe-8371/8372 in any available PCI Express slot.

You can also daisy-chain from a PXI Express chassis that is already controlled by an embedded controller, host PC, or laptop to additional PXI Express chassis using MXI-Express x4 products. For available options, refer to Tables 2-1 and 2-2, in Chapter 2, [Getting Started](#).

Figure 1-6 shows how you can use MXI-Express x4 cards to connect multiple PXI Express expansion chassis to a PC in a star or daisy-chain topology.



**Figure 1-6.** Example of MXI-Express x4 System Expansion Topologies

---

# Getting Started

This chapter explains what you will need to set up various MXI-Express x4 hardware configurations.

The products covered by this guide are the NI PCIe-8371/8372 and NI PXIe-8370/8374. For the remainder of this manual the term *MXI-Express x4 product* refers to any of these products.

Additional compatible products are included in subsequent tables, but are not covered in this manual.

## Terminology

---

The following terms may be used throughout this document:

- **Host PC**—A host computer with at least one PCI Express x4 or wider slot available.



**Note** Using a PCI Express slot wider than x4 may result in negotiation down to x1 width, and therefore limiting bandwidth. This is uncommon in newer PCs.

- **Expansion Chassis**—An expansion chassis of any of the following types:
  - CompactPCI Express chassis
  - PXI Express chassis
  - NI HDD RAID
- **MXI-Express x4 copper cable**—Standard PCI Express specification compliant cable with x4 PCIe connectors.



**Note** Refer to the [Cabling](#) section of Chapter 3, [Installation and Configuration](#), for details. Most MXI-Express kits include the cable, but not all.

- **Host Board**—The MXI-Express x4 board of a cabled pair of boards that is closer to the CPU.
- **Target Board**—The MXI-Express x4 board of a cabled pair of boards that is farther from the CPU.

- **Cabled Pair**—Two MXI-Express x4 boards that are connected with a single cable.

# Connecting a PC to an Expansion Chassis

## Using a MXI-Express x4 Copper Cable

Refer to the [Terminology](#) section for more detail on the items in this list.

### Equipment Needed

- ☐ Host PC
- ☐ Expansion chassis
- ☐ MXI-Express x4 copper cable
- ☐ A MXI-Express x4 host board and target board that is appropriate for the host system slot and target chassis. Refer to Table 2-1 for more information.

**Table 2-1.** MXI-Express x4 Connectivity Support from a Host PC Using a x4 Copper Cable

| From Host   |              | Targets             |             |             |             |
|---|--------------|---------------------|-------------|-------------|-------------|
| Slot Type   | Product      | PXI Express Chassis | HDD RAID    |             |             |
|   |              | NI PXIe-8370        | NI HDD-8263 | NI HDD-8264 | NI HDD-8265 |
| PCI Express x4  | NI PCIe-8371 | ✓                   | ✓           | ✓           | ✓           |
| PCI Express x4  | NI PCIe-8372 | ✓                   | ✓           | ✓           | ✓           |
| <b>Note:</b> For installation instructions and other information about the NI HDD series of products, refer to their respective user manuals. |              |                     |             |             |             |



**Note** For full PXI or PXI Express functionality, refer to the [Software Installation and Configuration](#) section of Chapter 3, [Installation and Configuration](#), for more information.



# Connecting Additional Expansion Chassis to a System

## Using a MXI-Express x4 Copper Cable

Refer to the [Terminology](#) section for more detail on the items in this list.

### Equipment Needed

- ☐ Chassis to daisy-chain from
- ☐ Expansion chassis to daisy-chain to
- ☐ MXI-Express x4 copper cable
- ☐ A MXI-Express x4 host board and target board that is appropriate for the host system slot and target chassis. Refer to Table 2-2 for more information.

**Table 2-2.** MXI-Express x4 Connectivity Support from a Chassis Using a x4 Copper Cable

| From Chassis  |              | Targets             |             |             |             |
|---|--------------|---------------------|-------------|-------------|-------------|
| Slot Type   | Product      | PXI Express Chassis | HDD RAID    |             |             |
|   |              | NI PXIe-8370        | NI HDD-8263 | NI HDD-8264 | NI HDD-8265 |
| PXI Express x4  | NI PXIe-8374 | ✓                   | ✓           | ✓           | ✓           |
| PXI Express x4  | NI 8262      | —                   | ✓           | ✓           | ✓           |
| <b>Note:</b> For installation instructions and other information about the NI HDD series of products, refer to their respective user manuals. |              |                     |             |             |             |



**Note** For full PXI or PXI Express functionality, refer to the [Software Installation and Configuration](#) section of Chapter 3, [Installation and Configuration](#), for more information.

---

# Installation and Configuration

This chapter explains how to unpack, install, and configure the MXI-Express x4 hardware and software.

## Unpacking

---

Your MXI-Express x4 cards are shipped in antistatic packages to prevent electrostatic damage (ESD) to the devices. ESD can damage several components on the device.



**Caution** *Never* touch the exposed pins of connectors. Doing so may damage the device.

To avoid such damage in handling the device, take the following precautions:

- Ground yourself using a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal part of the computer chassis before removing the device from the package.

Remove the device from the package and inspect the device for loose components or any sign of damage. Notify NI if the device appears damaged in any way. Do *not* install a damaged device into the computer or into a PXI Express or CompactPCI Express chassis.

Store the device in the antistatic envelope when not in use.

# Hardware Installation

---

The following are general instructions for installing the MXI-Express x4 cards. Consult your computer user manual or technical reference manual for specific instructions and warnings.

## Installing an NI PCIe-8371/8372

Complete the following steps to install the NI PCIe-8371/8372 in your computer.

1. Power off your computer.



**Caution** To protect both yourself and the computer from electrical hazards, your computer should remain off until you finish installing all hardware as instructed.

2. Remove the top cover or access port to the PCI Express expansion slots.
3. Touch the metal part of the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.
4. Unplug the computer and wait 30 seconds to allow the energy stored in the computer's power supply to fully dissipate.
5. Select any available PCI Express expansion slot (x4 or wider).



**Note** Using a PCI Express slot wider than x4 may result in negotiation down to x1 width, which will reduce throughput performance. This is rare in modern systems.



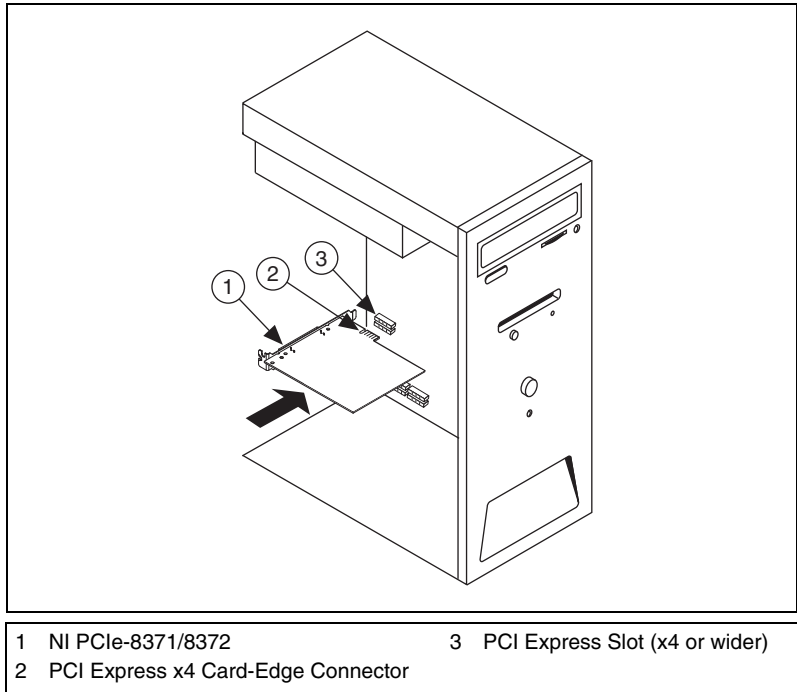
**Note** The BIOS or motherboard may not support the NI PCIe-8371/8372 in a slot intended for a graphics card.



**Note** Not all PCI Express expansion slots that have x4 or wider physical connectors are electrically capable of x4 PCI Express operation. Check with the motherboard manufacturer to verify that the slot is capable of x4 PCI Express operation.

6. Locate the metal bracket that covers the cut-out in the back panel of the computer for the slot you have selected. Remove and save the bracket-retaining screw and the bracket cover.
7. Line up the NI PCIe-8371/8372 with the slot on the back panel. Slowly lower the NI PCIe-8371/8372 until its card-edge connector is resting on the expansion slot receptacle. Using slow, evenly distributed pressure, press the NI PCIe-8371/8372 straight down until it seats in the expansion slot, as shown in Figure 3-1.

8. Secure the N1PCIe-8371/8372 to the back panel rail using a bracket retaining screw.
9. Replace the computer cover.
10. Plug the computer back in.

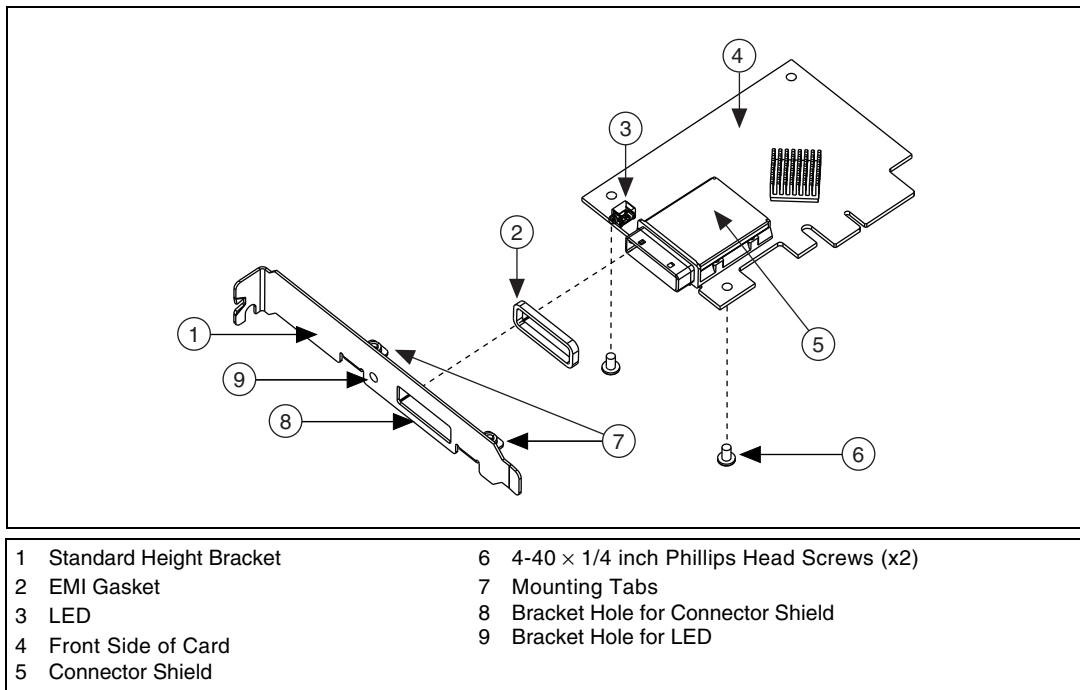


**Figure 3-1. Installing the NI PCIe-8371/8372**

## Installing the Low-Profile Bracket on the NI PCIe-8371 (Optional)

To install the NI PCIe-8371 in a host computer that requires a low-profile height card, the front bracket must be replaced with the low-profile bracket included with your kit. Complete the following steps to replace the bracket.

1. Remove the standard height front bracket already installed on your NI PCIe-8371 card by removing the two 4-40 x 1/4 inch Phillips head screws that attach the bracket to the card. Note that the two mounting tabs for the standard height bracket rest against the *front* side of the card, which is the side upon which the cable receptacle connector housing rests. Set the two screws aside to re-use when installing the low-profile bracket.



**Figure 3-2.** Removing the Standard Height Bracket from the NI PCIe-8371



**Caution** When removing the bracket, be careful not to remove or lose the EMI gasket on the cable receptacle connector housing.

2. Fit the low-profile bracket onto the NI PCIe-8371. Note that the two mounting tabs that the screws thread into rest against the *back* side of the card for the low-profile bracket. Ensure that the front bracket LED bulb is situated in the display hole correctly.
3. Align the mounting holes on the card with the threaded holes on the mounting tabs of the bracket, and insert the screws from the *front* side.
4. Tighten each screw to a maximum torque of 3.6 lb · in. (0.407 N · m).

## Installing an NI PXIe-8370 or NI PXIe-8374

Table 3-1 provides information on which PXI Express MXI-Express x4 boards are compatible with which chassis slot types.

**Table 3-1.** NI MXI-Express x4 PXI Express Board Slot Type Compatibility

| NI PXI Express Board | PXI Express Chassis |                 |                          |
|----------------------|---------------------|-----------------|--------------------------|
|                      | Controller<br>▲     | Peripheral<br>● | Hybrid<br>● <sup>H</sup> |
| NI PXIe-8370         | ✓                   | —               | —                        |
| NI PXIe-8374         | —                   | ✓               | ✓                        |



**Note** For this section, all of the above products will be referred to as an “NI PXI Express board”.

Complete the following steps to install the NI PXI Express board in your PXI Express or CompactPCI Express chassis.

1. Power off your PXI Express or CompactPCI Express chassis, but leave it plugged in while installing the NI PXI Express board. The power cord grounds the chassis and protects it from electrical damage while you install the module.



**Caution** To protect both yourself and the chassis from electrical hazards, leave the chassis off until you finish installing the NI PXI Express board.

2. Remove or open any doors or covers blocking access to the slot in which you intend to install the NI PXI Express board.
3. Touch a metal part of the chassis to discharge any static electricity that might be on your clothes or body.
4. Make sure the injector/ejector handle is in its downward position. Be sure to remove all connector packaging and protective caps from retaining screws on the module. Align the NI PXI Express board with the card guides on the top and bottom of the system controller slot.



**Caution** Do *not* raise the injector/ejector handle as you insert the NI PXI Express board. It will not insert properly unless the handle is in its downward position so that it does not interfere with the injector/ejector rail on the chassis, as shown in Figure 3-3.

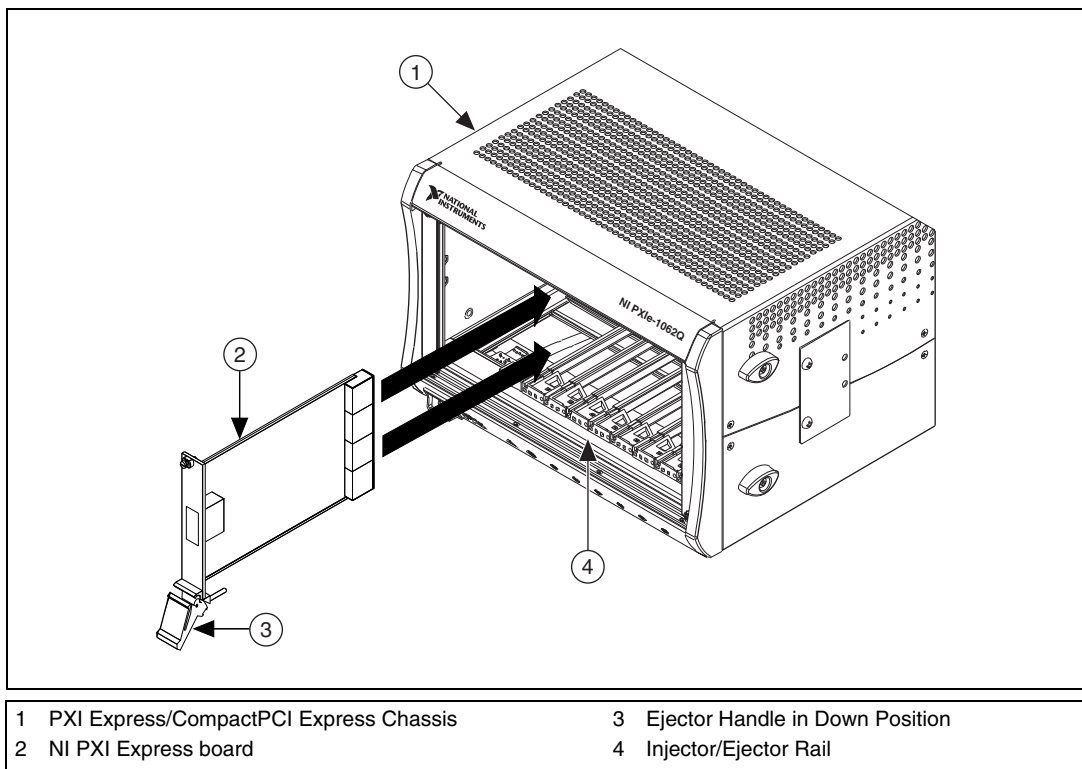
5. Hold the handle as you slowly slide the module into the chassis until the handle catches on the injector/ejector rail.
6. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the NI PXI Express board should be even with the front panel of the chassis.



**Note** LEDs on the back side of the NI PXIe-8370 will light, indicating the presence of 5 V auxiliary power. Refer to the [LED Indicators](#) section for details.

7. Tighten the bracket-retaining screws on the top and bottom of the front panel to secure the NI PXI Express board to the chassis.
8. Replace or close any doors or covers to the chassis.

Figure 3-3 shows an NI PXI Express board just before installation in the system controller slot of a National Instruments PXI Express chassis.



**Figure 3-3.** Example NI PXI Express Board Installation Into a PXI Express Chassis

## Cabling

MXI-Express x4 is available with copper cables of various lengths. Table 3-2 shows the MXI-Express x4 copper cables<sup>1</sup> available from National Instruments.

**Table 3-2.** National Instruments MXI-Express x4 Copper Cables

| Cable Length (Meters) | Description                 | Part Number |
|-----------------------|-----------------------------|-------------|
| 3 m                   | MXI-Express x4 copper cable | 779725-03   |
| 7 m                   | MXI-Express x4 copper cable | 779725-07   |

Connect the MXI-Express x4 cable to both MXI-Express x4 cards. The cables have no polarity, so either end may be connected to either card.



**Caution** Do *not* remove the cable after the system is powered on. Doing so can hang or cause errors in applications communicating with devices behind MXI-Express x4. If a cable becomes unplugged, plug it back into the system. (You may need to restart your computer.)

## Powering On the MXI-Express x4 System

1. Power-on all of the expansion chassis in any order you choose.
2. Power-on the host.



**Note** There are no requirements on how MXI-Express x4 expansion chassis are powered up relative to each other, as long as they are all on before the computer is powered on.

3. Observe the LED status on the NI PCIe-8371, NI PCIe-8372, NI PXIe-8370 and NI PXIe-8374 where applicable. A properly connected and powered up system should report a valid link and power status on *all* of these boards once the host PC is powered on. Refer to the [LED Indicators](#) section for more information.

Typical PCI-PCI bridges and switches are used to add PCI devices to a PCI hierarchy in which all the bridges and devices are contained within a single chassis. Because of this, BIOSes and operating systems make the assumption that all PCI devices in the entire hierarchy will be available as soon as code execution begins at power-up time. This assumption means

<sup>1</sup> For more information, refer to the [Terminology](#) section of Chapter 2, [Getting Started](#).



that all of the expansion chassis must be turned on before the host PC for the BIOS and OS to correctly configure a MXI-Express x4 system.

## Powering Off the MXI-Express x4 System

Because operating systems and drivers commonly make the assumption that PCI devices will be present in the system from power-up to power-down, it is important to not power off the expansion chassis until after the host PC is powered off. Powering off the expansion chassis while the host is still on can cause crashes or hangs. However, once the host pc is powered off, the order that the expansion chassis are powered off is not important.



**Note** To power down the chassis while the host computer or host chassis is on, you may need to hold the power button for at least four seconds. However, this behavior cannot be guaranteed.

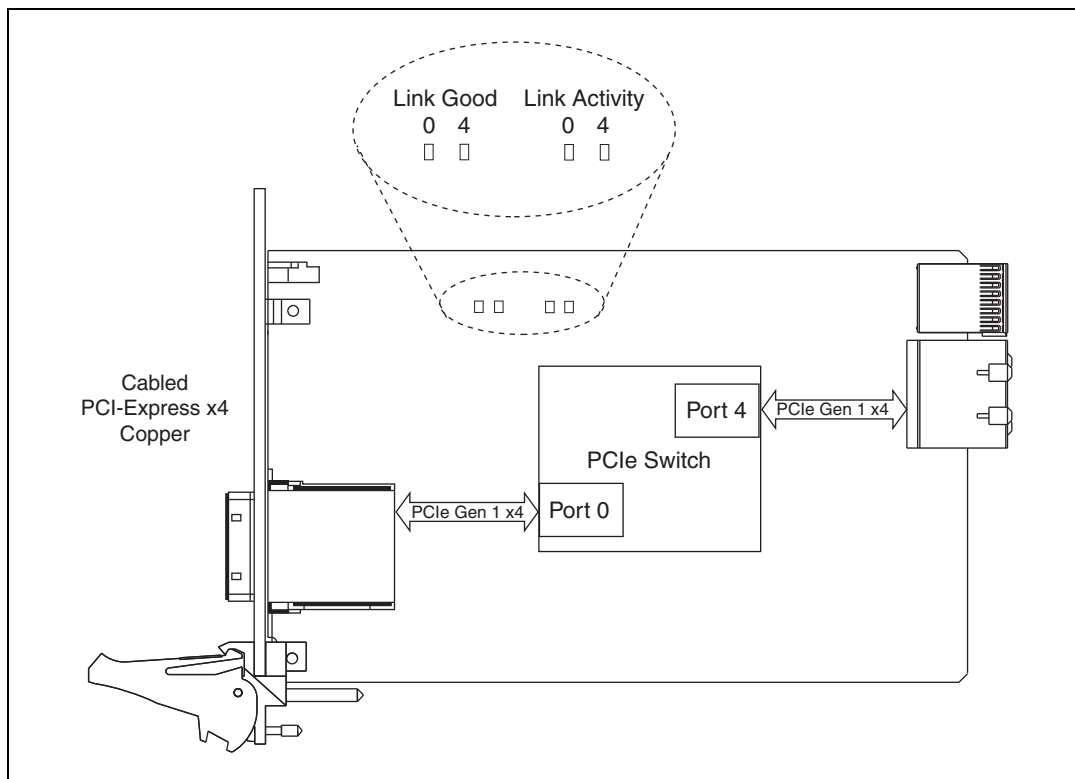
# LED Indicators

The LEDs on MXI-Express x4 cards give status information about power supplies and link state. The NI PCIe-8371 and NI PXIe-8374 have one tri-color LED on the panel, indicating power and link status. The NI PCIe-8372 has two tri-color LEDs on the panel, indicating power and link status for each port. The NI PXIe-8370 has two LEDs, one for power supply status and one for link state.

**Table 3-3.** LED Status Descriptions of MXI-Express x4 Products

| Board  | LED      | Color        | Meaning                                     |
|--|----------|--------------|---|
| <a href="#">NI PCIe-8371 (199994x-01L)</a><br><a href="#">NI PXIe-8374 (193970x-02L)</a> | PWR/LINK | Off          | Power is off                                |
|  |          | Blinking Red | Power is out of spec                        |
|  |          | Solid Amber  | Power is within spec;<br>no link to chassis |
|  |          | Solid Green  | Power is within spec;<br>link established   |
| <a href="#">NI PCIe-8372 (194591x-01L)</a>   | PWR/LINK | Off          | Power is off                                |
|  |          | Solid Red    | Power is out of spec                        |
|  |          | Solid Amber  | Power is within spec;<br>no link to chassis |
|  |          | Solid Green  | Power is within spec;<br>link established   |
| <a href="#">NI PXIe-8370 (194402x-02)</a>  | PWR      | Off          | No power                                    |
|  |          | Blinking Red | Power is out of spec                        |
|  |          | Solid Green  | Power is within spec                        |
|  | LINK     | Off          | Link not established                        |
|  |          | Solid Green  | Link established                            |

Refer to Figure 3-4 for onboard LED locations.

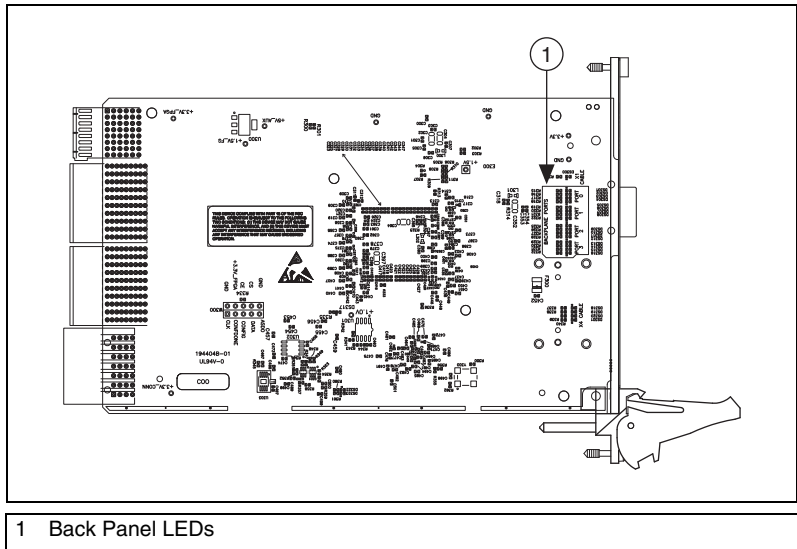


**Figure 3-4.** NI PXIe-8374 (193970x-02L) Onboard LED Locations

**Link Good LEDs**—LEDs that indicate a successful cable link (LED 0) and backplane link (LED 4).

**Link Activity LEDs**—LEDs that indicate link activity on the cable link (LED 0) and the backplane link (LED 4).

The NI PXIe-8370 also has a vertical column of 16 LEDs on the back panel of the card near the front connector, as shown in Figure 3-5. These LEDs provide additional information about the link status of the PCI Express lanes on the module to the backplane. Each group of four LEDs corresponds to one of the four PCI Express links to the backplane.



**Figure 3-5.** NI PXIe-8370 Back Side LED Locations



**Notes** If you are using a chassis (such as the NI PXIe-1062) that directly links the PXI Express board, the LEDs to that slot will not illuminate until you have a PXI Express board installed and linked.

If you are using the NI PXIe-1062 chassis, you will notice that the last group of LEDs has an LED (PORT 3) illuminated even if no boards are populated in the slots. Since the NI PXIe-1062 uses the last link for a PCI Express to PCI bridge for PXI communication, this link should always be active. Different chassis topologies will give different default behaviors. Contact your chassis' manufacturer for more information on your chassis' topology.

# Software Installation and Configuration

---

## Installation

MXI-Express x4 is based on PCI Express technology, using PCI Express switches and/or bridges to enable control of a PXI Express chassis from a PC or another PXI Express chassis with an available PCI Express or PXI Express slot. This technology will be recognized as a collection of PCI-to-PCI bridges to the operating system, and should automatically have CompactPCI Express level support without any additional software.



**Note** For full PXI/PXI Express functionality such as chassis and controller identification, trigger routing, and slot detection, install the PXI Platform Services software included with your kit. This software also can be found at [ni.com/updates](http://ni.com/updates) by searching for **PXI Platform Services**.

For operating system support, refer to the KnowledgeBase **53399AQ7**, *PXI Platform Services Operating System Support*, at [ni.com/kb](http://ni.com/kb).

## Configuring Your System



**Note** The following requires the PXI Platform Services software and Measurement & Automation Explorer (MAX), included on your *PXI Platform Services* CD or your driver CD.

For information on configuring your system in MAX, open MAX and navigate to **Help»Help Topics»PXI**.

---

# Common Questions

This appendix lists common questions related to the use of the MXI-Express x4 controllers.

## General Hardware

---

**How does the NI PCIe-8371 (part number 194591x-02) differ from the NI PCIe-8371 (part number 199994x-01)?**

Besides the physical weight and size reduction, there is now a front panel LED that indicates link status, as shown in Table 3-3, *LED Status Descriptions of MXI-Express x4 Products*. The smaller size allows the NI PCIe-8371 to fit in systems requiring a low-profile card when used with the low-profile front bracket included with the card.

The user may see a small performance increase and/or reduced latency in most applications, but otherwise there is no functional difference.

**What connectors do the NI MXI-Express x4 coppers cables use?**

The NI MXI-Express x4 copper cables use x4 PCIe connectors. For more information about these connectors visit Molex at [www.molex.com](http://www.molex.com) and search for **x4 PCIe iPass**.

**How many PXI bus segments can I connect together with MXI-Express x4?**

The PCI specification allows up to 255 bus segments. MXI-Express x4 does not limit this number, but the maximum number of bus segments allowed can be BIOS or operating system dependent. Also, a computer may already have several PCI bus segments internally, and the MXI-Express x4 link also has multiple PCI buses internally. Every PCI Express device has at least 1 bus segment, though it will have more if it includes a bridge or switch.

**Will my PC work with MXI-Express x4 products?**

It will depend on the robustness of the BIOS in your PC. In most cases, the BIOS should be able to enumerate the bridge resources that the MXI products require for operation, especially for smaller MXI system configurations. For more information, refer to the NI Developer Zone article, *Tips to Help You Successfully Use NI MXI-Express Controllers*, at [ni.com/zone](http://ni.com/zone).

**What is the maximum length of a MXI-Express x4 copper cable?**

The maximum length for a MXI-Express x4 copper cable is 7 m. National Instruments offers 3 m and 7 m copper cables. Refer to the [Cabling](#) section of Chapter 3, *Installation and Configuration*, for more information.

## MXI-3 and MXI-4 to MXI-Express x4 Upgrade Questions

---

**What are some of the improvements from MXI-3 and MXI-4 to MXI-Express x4?**

MXI-Express x4 incorporates the latest technology to include:

- Support for PCI Express slots.
- Support for PXI Express and CompactPCI Express chassis.
- Improved error correction and handling for noisy or harsh environments.
- Improved mechanical connectivity.
- Improved performance.
- Support for two chassis from a single card in the host PC.

**Can a MXI-3, MXI-4, and MXI-Express x4 board be used together directly?**

No. MXI-3, MXI-4, and MXI-Express x4 boards use different cable connectors and cannot be connected together. Additionally, the board-to-board communication protocols differ.

**Can I use a MXI-3, MXI-4, and MXI-Express x4 kit in the same multichassis PXI system?**

Yes. Different MXI kits can be intermixed to connect multiple PXI and PXI Express chassis together. As mentioned previously, an individual MXI-3 or MXI-4 board will not cable directly to a MXI-Express x4 board.

**MXI-3 and MXI-4 systems required the use of a specific boot ordering. Is this a requirement with MXI-Express x4?**

Yes. The requirements of the PCI bus still mandate that you must power-on secondary PXI/PXI Express chassis before powering on the host PC when using MXI-Express x4.

With MXI-3 and several chassis connected in series (daisy chain configuration), you were required to power-on the chassis in order starting with the chassis at the end of the chain and move towards the host controller. Now with MXI-Express x4, multiple chassis are connected in parallel and can be powered on in any order, except that you need to ensure that the last component powered on is the host PC.

For more details, refer to the [Powering On the MXI-Express x4 System](#) section of Chapter 3, [Installation and Configuration](#).

## General Software

---

**Under which operating systems will MXI-Express x4 products work?**

MXI-Express x4 will be recognized as a collection of PCI-to-PCI bridges to the majority of operating systems. It should automatically have CompactPCI Express support with most systems like Windows, Macintosh OS X, Linux, and Solaris. For full PXI Express functionality, PXI Platform Services software is required. Refer to the [Software Installation and Configuration](#) section of Chapter 3, [Installation and Configuration](#), for more information.

**What software is required to use my MXI-Express x4 kit?**

For Windows and LabVIEW RT, the required software is included as part of the latest version of NI PXI Platform Services included with your kit. The software for your MXI-Express x4 controller enhances the product, allowing you to view information about the organization of your PXI Express system, gain access to the trigger routing capabilities of the PXI Express chassis, and programmatically retrieve data about the chassis and modules you have installed.

Please refer to the following KnowledgeBase for the current supported operating systems for NI PXI Platform Services:

*KB 53399AQ7: PXI Platform Services Operating System Support*

If your operating system is not supported by PXI Platform Services, you can still use MXI-Express x4 as a PCI Express expansion solution.



However, access to features such as chassis and controller identification, trigger routing, and slot detection will be lost.

**MXI-3 required optimization software. Does MXI-Express x4 require the same?**

No. The necessary optimization is now done automatically by the MXI-Express x4 hardware.

---

# Specifications

This appendix lists the system specifications for the following products only:

- [NI PCIe-8371 \(199994x-01L\)](#)
- [NI PCIe-8372 \(194591x-01L\)](#)
- [NI PXIe-8370 \(194402x-02\)](#)
- [NI PXIe-8374 \(193970x-02L\)](#)



**Note** The model numbers listed are followed by their specific NI assembly numbers in parentheses. Ensure the specifications of interest match the NI assembly number that is printed on either the front or back side of the board.



**Note** *x* denotes all letter revisions of the assembly.

The boards in the table above are the latest generation of MXI-Express x4 products. For specifications on previous generations of these products, refer to Appendix C, [Legacy Specifications](#).

- [NI PCIe-8371 \(194591x-02\)](#)<sup>1</sup>
- [NI PCIe-8372 \(194591x-01\)](#)<sup>1</sup>

---

<sup>1</sup> No longer available for purchase.

# NI PCIe-8371 (199994x-01L)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

|                            |   |
|----------------------------|---|
| Dimensions .....           | 6.89 × 8.95 cm<br>(2.71 × 3.55 in.)   |
| Maximum cable length ..... | 7 m   |
| Slot requirements .....    | One slot (PCI Express, x4 or wider)   |
| Compatibility .....        | Fully compatible with the<br><i>PCI Express Specification</i> ,<br>Revision 1.0a, 1.1 |
| Weight .....               | 0.06 kg (0.14 lb) typical   |

## Power Requirements

| Power Rail            | Typical Current | Maximum Current |
|-----------------------|-----------------|-----------------|
| +3.3 V                | 150 mA          | 200 mA          |
| +3.3 V <sub>Aux</sub> | 0 A             | 0 A             |
| +12 V                 | 170 mA          | 320 mA          |

## Environment

Maximum altitude ..... 2,000 m

Pollution Degree ..... 2

Indoor use only.

## Operating Environment

Ambient temperature range..... 0 to 55 °C  
(Tested in accordance with  
IEC-60068-2-1 and  
IEC-60068-2-2.)

Relative humidity range ..... 10 to 90%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)

## Storage Environment

Ambient temperature range..... -40 to 70 °C  
(Tested in accordance with  
IEC-60068-2-1 and  
IEC-60068-2-2.)

Relative humidity range ..... 5 to 95%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)



**Caution** Clean the NI PCIe-8371 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** For EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

# NI PCIe-8372 (194591x-01L)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

|                            |  |
|----------------------------|--|
| Dimensions .....           | 10.7 × 17.5 cm<br>(4.4 × 6.9 in.)  |
| Maximum cable length ..... | 7 m  |
| Slot requirements .....    | One slot (PCI Express, x4 or wider)  |
| Compatibility .....        | Fully compatible with the<br><i>PCI Express Specification</i> ,<br>Revision 1.0a |
| Weight .....               | 0.19 kg (0.42 lb) typical  |

## Power Requirements

| Power Rail            | Typical Current | Maximum Current |
|-----------------------|-----------------|-----------------|
| +3.3 V                | 1.8 A           | 2.0 A           |
| +3.3 V <sub>Aux</sub> | 1 mA            | 25 mA           |
| +12 V                 | 0 A             | 0 A             |

## Environment

|                        |         |
|------------------------|---------|
| Maximum altitude.....  | 2,000 m |
| Pollution Degree ..... | 2       |
| Indoor use only.       |         |

## Operating Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | 0 to 55 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2.) |
| Relative humidity range .....  | 10 to 90%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)       |

## Storage Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | –20 to 70 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2.) |
| Relative humidity range .....  | 5 to 95%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)          |



**Caution** Clean the NI PCIe-8372 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.



## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** For EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

# NI PXIe-8370 (194402x-02)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

|                            |   |
|----------------------------|---|
| Dimensions .....           | 10.0 × 16.0 cm<br>(3.9 × 6.3 in.)   |
| Maximum cable length ..... | 7 m   |
| Slot requirements .....    | One system slot (PXI Express or CompactPCI Express)   |
| Compatibility .....        | Fully compatible with the<br><i>PXI Express Hardware Specification</i> , Revision 1.0 and<br>the <i>PICMG CompactPCI Express EXP.0 R1.0 Specification</i> |
| Weight .....               | 0.17 kg (0.37 lb) typical   |

## Power Requirements

| Power Rail          | Typical Current | Maximum Current |
|---------------------|-----------------|-----------------|
| +3.3 V              | 2.5 A           | 3 A             |
| +5 V                | 0 A             | 5 mA            |
| +12 V               | 0 A             | 1 mA            |
| +5 V <sub>Aux</sub> | 300 mA          | 400 mA          |

## Environment

|                        |         |
|------------------------|---------|
| Maximum altitude.....  | 2,000 m |
| Pollution Degree ..... | 2       |
| Indoor use only.       |         |

## Operating Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | 0 to 55 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2. Meets<br>MIL-PRF-28800F Class 3<br>low temperature limit and<br>MIL-PRF-28800F Class 2<br>high temperature limit.) |
| Relative humidity range .....  | 10 to 90%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)   |

## Storage Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | –40 to 71 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2. Meets<br>MIL-PRF-28800F Class 3 limits.) |
| Relative humidity range .....  | 5 to 95%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)  |

## Shock and Vibration

|                         |   |
|-------------------------|---|
| Operational shock ..... | 30 g peak, half-sine, 11 ms pulse<br>(Tested in accordance with<br>IEC-60068-2-27. Meets<br>MIL-PRF-28800F Class 2 limits.) |
|-------------------------|---|

## Random Vibration

|                   |   |
|-------------------|---|
| Operating.....    | 5 to 500 Hz, 0.3 g <sub>rms</sub>   |
| Nonoperating..... | 5 to 500 Hz, 2.4 g <sub>rms</sub><br>(Tested in accordance<br>with IEC-60068-2-64.<br>Nonoperating test profile<br>exceeds the requirements of<br>MIL-PRF-28800F, Class 3.) |



**Caution** Clean the NI PXIe-8370 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** For EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

# NI PXIe-8374 (193970x-02L)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

|                            |  |
|----------------------------|--|
| Dimensions .....           | 10.0 × 16.0 cm<br>(3.9 × 6.3 in.)  |
| Maximum cable length ..... | 7 m  |
| Slot requirements .....    | One peripheral slot (PXI Express<br>or CompactPCI Express)   |
| Compatibility .....        | Fully compatible with the<br><i>PXI Express Hardware<br/>Specification, Revision 1.0</i> and<br>the <i>PICMG CompactPCI Express<br/>EXP.0 R1.0 Specification</i> |
| Weight .....               | 0.16 kg (0.35 lb) typical  |

## Power Requirements

| Power Rail          | Typical Current | Maximum Current |
|---------------------|-----------------|-----------------|
| +3.3 V              | 480 mA          | 700 mA          |
| +12 V               | 430 mA          | 750 mA          |
| +5 V <sub>Aux</sub> | 5 mA            | 20 mA           |

## Environment

|                        |         |
|------------------------|---------|
| Maximum altitude.....  | 2,000 m |
| Pollution Degree ..... | 2       |
| Indoor use only.       |         |

## Operating Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | 0 to 55 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2. Meets<br>MIL-PRF-28800F Class 3<br>low temperature limit and<br>MIL-PRF-28800F Class 2<br>high temperature limit.) |
| Relative humidity range .....  | 10 to 90%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)   |

## Storage Environment

|                                |  |
|--------------------------------|--|
| Ambient temperature range..... | –40 to 71 °C<br>(Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2. Meets<br>MIL-PRF-28800F Class 3 limits.) |
| Relative humidity range .....  | 5 to 95%, noncondensing<br>(Tested in accordance with<br>IEC-60068-2-56.)  |

## Shock and Vibration

|                         |   |
|-------------------------|---|
| Operational shock ..... | 30 g peak, half-sine, 11 ms pulse<br>(Tested in accordance with<br>IEC-60068-2-27. Meets<br>MIL-PRF-28800F Class 2 limits.) |
|-------------------------|---|

## Random Vibration

|                   |   |
|-------------------|---|
| Operating.....    | 5 to 500 Hz, 0.3 g <sub>rms</sub>   |
| Nonoperating..... | 5 to 500 Hz, 2.4 g <sub>rms</sub><br>(Tested in accordance<br>with IEC-60068-2-64.<br>Nonoperating test profile<br>exceeds the requirements of<br>MIL-PRF-28800F, Class 3.) |





**Caution** Clean the NI PXIe-8374 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** For EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

---

# Legacy Specifications

This appendix lists the system specifications for the following product only:

- [NI PCIe-8371 \(194591x-02\)](#) <sup>1</sup>
- [NI PCIe-8372 \(194591x-01\)](#) <sup>1</sup>



**Note** *x* denotes all letter revisions of the assembly.



**Note** The NI assembly part number is printed on either the front or back side of the board.

The boards in the table above are previous generations of MXI-Express x4 products. For specifications on latest generation products, refer to Appendix B, [Specifications](#).

---

<sup>1</sup> No longer available for purchase.

# NI PCIe-8371 (194591x-02)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

|                            |  |
|----------------------------|--|
| Dimensions .....           | 10.7 × 17.5 cm (4.4 × 6.9 in.)   |
| Maximum cable length ..... | 7 m  |
| Slot requirements .....    | One slot (PCI Express, x4 or wider)  |
| Compatibility .....        | Fully compatible with the<br><i>PCI Express Specification</i> ,<br>Revision 1.0a |
| Weight .....               | 0.19 kg (0.42 lb) typical  |

## Power Requirements

| Power Rail            | Typical Current | Maximum Current |
|-----------------------|-----------------|-----------------|
| +3.3 V                | 1.8 A           | 2.0 A           |
| +3.3 V <sub>Aux</sub> | 1 mA            | 25 mA           |
| +12 V                 | 0 A             | 1 A             |

## Environment

|                        |         |
|------------------------|---------|
| Maximum altitude.....  | 2,000 m |
| Pollution Degree ..... | 2       |
| Indoor use only.       |         |

## Operating Environment

|  |            |
|--|------------|
| Ambient temperature range .....                                    | 0 to 55 °C |
| (Tested in accordance with<br>IEC-60068-2-1 and<br>IEC-60068-2-2.) |            |

Relative humidity range ..... 10 to 90%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)

## Storage Environment

Ambient temperature range ..... –20 to 70 °C  
(Tested in accordance with  
IEC-60068-2-1 and  
IEC-60068-2-2.)

Relative humidity range ..... 5 to 95%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)



**Caution** Clean the NI PCIe-8371 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Caution** For EMC compliance, operate this device with shielded cables and accessories.



**Note** For EMC declarations and certifications, refer to the [Online Product Certification](#) section.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

# NI PCIe-8372 (194591x-01)



**Note** These specifications are typical at 25 °C, unless otherwise stated, and are subject to change without notice.

## Physical

Dimensions..... 10.7 × 17.5 cm (4.4 × 6.9 in.)

Maximum cable length..... 7 m

Slot requirements ..... One slot (PCI Express x4 or wider)

Compatibility ..... Fully compatible with the  
*PCI Express Specification,*  
Revision 1.0a

Weight..... 0.19 kg (0.42 lb) typical

## Power Requirements

| Power Rail            | Typical Current | Maximum Current |
|-----------------------|-----------------|-----------------|
| +3.3 V                | 1.8 A           | 2.0 A           |
| +3.3 V <sub>AUX</sub> | 1 mA            | 25 mA           |
| +12 V                 | 0 A             | 0 A             |

# Environment

Maximum altitude.....2,000 m

Pollution Degree .....2

Indoor use only.

# Operating Environment

Ambient temperature range .....0 to 55 °C  
(Tested in accordance with  
IEC-60068-2-1 and  
IEC-60068-2-2.)

Relative humidity range.....10 to 90%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)

# Storage Environment

Ambient temperature range .....–20 to 70 °C  
(Tested in accordance with  
IEC-60068-2-1 and  
IEC-60068-2-2.)

Relative humidity range.....5 to 95%, noncondensing  
(Tested in accordance with  
IEC-60068-2-56.)



**Caution** Clean the NI PCIe-8372 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

# Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.



## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Caution** For EMC compliance, operate this device with shielded cables and accessories.



**Note** For EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance C E

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

---

# Technical Support and Professional Services

Visit the following sections of the award-winning National Instruments Web site at [ni.com](http://ni.com) for technical support and professional services:

- **Support**—Technical support at [ni.com/support](http://ni.com/support) includes the following resources:
  - **Self-Help Technical Resources**—For answers and solutions, visit [ni.com/support](http://ni.com/support) for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on. Registered users also receive access to the NI Discussion Forums at [ni.com/forums](http://ni.com/forums). NI Applications Engineers make sure every question submitted online receives an answer.
  - **Standard Service Program Membership**—This program entitles members to direct access to NI Applications Engineers via phone and email for one-to-one technical support, as well as exclusive access to eLearning training modules at [ni.com/eLearning](http://ni.com/eLearning). NI offers complementary membership for a full year after purchase, after which you may renew to continue your benefits.

For information about other technical support options in your area, visit [ni.com/services](http://ni.com/services), or contact your local office at [ni.com/contact](http://ni.com/contact).
- **Training and Certification**—Visit [ni.com/training](http://ni.com/training) for training and certification program information. You can also register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit [ni.com/alliance](http://ni.com/alliance).

- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer’s declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting [ni.com/certification](http://ni.com/certification).
- **Calibration Certificate**—If your product supports calibration, you can obtain the calibration certificate for your product at [ni.com/calibration](http://ni.com/calibration).

You also can visit the Worldwide Offices section of [ni.com/niglobal](http://ni.com/niglobal) to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

# Glossary

---

| Symbol | Prefix | Value      |
|--------|--------|------------|
| p      | pico   | $10^{-12}$ |
| n      | nano   | $10^{-9}$  |
| $\mu$  | micro  | $10^{-6}$  |
| m      | milli  | $10^{-3}$  |
| k      | kilo   | $10^3$     |
| M      | mega   | $10^6$     |
| G      | giga   | $10^9$     |
| T      | tera   | $10^{12}$  |

## Symbols

|          |                        |
|----------|------------------------|
| °        | Degrees.               |
| $\geq$   | Equal or greater than. |
| $\leq$   | Equal or less than.    |
| %        | Percent.               |
| $\Omega$ | Ohms.                  |

## A

|      |  |
|------|--|
| A    | Amperes.   |
| ANSI | American National Standards Institute.   |
| API  | Application Programming Interface—the direct interface that an end user sees when creating an application. |

## B

|      |   |
|------|---|
| Byte | Byte—eight related bits of data, an 8-bit binary number. Also used to denote the amount of memory required to store one byte of data.   |
| BIOS | Basic Input/Output System. BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.                                    |
| bus  | The group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of buses include the ISA bus, PCI bus, PXI bus, VXI bus, and VME bus. |

## C

|                                 |   |
|---------------------------------|---|
| C                               | Celsius.  |
| cabled MXI-Express x4 connector | The cabled MXI-Express x4 connector provides all necessary signals to connect an NI PCIe-8371/8372 and an NI PXIe-8370. These signals include the PCI Express transmit and receive pairs, the system clock, presence detect signals, reset, and a wake-up signal. This connector is compatible with the <i>PCI Express External Cabling 1.0 Specification</i> . |
| cabled pair                     | Two MXI-Express x4 boards that are connected with a single cable.   |
| cabled PCI Express connector    | The cabled PCI Express connector provides all necessary signals to connect the MXI-Express x4 family of products. These signals include the PCI Express transmit and receive pair, the system clock, and a presence detect signal.  |
| CFR                             | Code of Federal Regulations.  |
| cm                              | Centimeters.  |
| clock                           | Hardware component that controls timing for reading from or writing to groups.  |

**CompactPCI** An adaptation of the Peripheral Component Interconnect (PCI) Specification 2.1 or later for industrial and/or embedded applications requiring a more robust mechanical form factor than desktop PCI. It uses industry standard mechanical components and high-performance connector technologies to provide an optimized system intended for rugged applications. It is electrically compatible with the PCI Specification, which enables low-cost PCI components to be utilized in a mechanical form factor suited for rugged environments.

**CSA** Canadian Standards Association.

## D

**daisy-chain** A method of propagating signals along a bus, in which the devices are prioritized on the basis of their position on the bus.

**DC** Direct current.

**device** A plug-in instrument card or pad that can contain multiple channels and conversion devices. Plug-in boards and PCMCIA cards, which connect to your computer parallel port, are examples of devices.

**DoC** Declaration of Conformity.

## E

**EEPROM** Electronically Erasable Programmable Read Only Memory—ROM that can be erased with an electrical signal and reprogrammed.

**EIA** Electronic Industries Association.

**EMC** Electromagnetic compliance.

**EMI** Electromagnetic interference.

**expansion chassis** Any CompactPCI, CompactPCI Express, PXI, PXI Express, VXI chassis or NI CompactRIO backplane.

## F

|              |   |
|--------------|---|
| FCC          | Federal Communications Commission.  |
| filler panel | A blank module front panel used to fill empty slots in the chassis.                                       |
| FPGA         | Field Programmable Gate Array—A logic device that has its functionality defined after it is manufactured. |

## G

|                  |  |
|------------------|--|
| g                | (1) Grams.<br>(2) A measure of acceleration equal to $9.8 \text{ m/s}^2$ .                                     |
| GPIB             | General Purpose Interface Bus (IEEE 488)   |
| $g_{\text{RMS}}$ | A measure of random vibration. The root mean square of acceleration levels in a random vibration test profile. |

## H

|            |  |
|------------|--|
| hex        | Hexadecimal—the numbering system with base 16, using the digits 0 to 9 and letters A to F. |
| host board | The MXI-Express x4 board of a cabled pair of boards that is closer to the CPU.             |
| host PC    | A host computer with at least one PCI Express x4 or wider slot available.                  |
| hr         | Hours.   |
| Hz         | Hertz; cycles per second.  |

## I

|     |   |
|-----|---|
| I/O | Input/output—the techniques, media, and devices used to achieve communication between machines and users.   |
| IEC | International Electrotechnical Commission. The IEC publishes internationally recognized standards. IEC 60068 contains information on environmental testing procedures and severities. |



|                   |   |
|-------------------|---|
| IEEE              | Institute of Electrical and Electronics Engineers                                     |
| in.               | Inches.   |
| instrument driver | A set of routines designed to control a specific instrument or family of instruments. |

## K

|    |   |
|----|---|
| K  | Kilo—the prefix for 1,024, or $2^{10}$ , used with B (byte) in quantifying data or computer memory.                 |
| k  | Kilo—the standard metric prefix for 1,000, or $10^3$ , used with units of measure such as volts, hertz, and meters. |
| kg | Kilograms.  |
| km | Kilometers.   |

## L

|        |   |
|--------|---|
| laptop | A portable computer with an available ExpressCard/34 or ExpressCard/54 slot with PCI Express support. |
| lb     | Pounds.   |
| LED    | Light emitting diode.   |

## M

|     |  |
|-----|--|
| m   | Meters.  |
| M   | Mmega—(1) the standard metric prefix for 1 million or $10^6$ , when used with units of measure such as volts and hertz; (2) the prefix for 1,048,576, or $2^{20}$ , when used with B (byte) to quantify data or computer memory. |
| MAX | NI Measurement & Automation Explorer, the utility that allows you to configure and test your PXI system.   |
| MHz | Megahertz. One million Hertz; one Hertz equals one cycle per second.   |
| ms  | Milliseconds.  |

|                             |   |
|-----------------------------|---|
| MXI                         | Multisystem eXtension Interface.  |
| MXI-3                       | A previous generation of MXI products (compared to MXI-4 and MXI-Express x1) that couples two physically separate PCI buses via a copper or fiber proprietary serial data link. |
| MXI-4                       | A previous generation of MXI products (compared to MXI-Express x1) that offers similar connectivity as MXI-3, but with link error correction capability.                        |
| MXI-Express                 | An extension of MXI based upon PCI Express.   |
| MXI-Express x4 copper cable | Standard PCI Express specification compliant cable with x4 PCIe connectors.   |

## N

|                       |   |
|-----------------------|---|
| NEMA                  | National Electrical Manufacturers Association.  |
| NI                    | National Instruments.   |
| NI-488.2 or NI-488.2M | The National Instruments industry-standard software for controlling GPIB instruments. |
| NI-DAQ                | The National Instruments industry-standard software for data acquisition instruments. |

## P

|                         |   |
|-------------------------|---|
| PCI                     | Peripheral Component Interconnect—A high-performance expansion bus architecture originally developed by Intel to replace ISA and EISA. It achieved widespread acceptance as a standard for PCs and workstations; it offers a theoretical maximum transfer rate of 132 Mbytes/s. |
| PCI card edge connector | The PCI card edge connector is the row of metal contacts along the bottom edge of a PCI plug-in card. The details for this connector are defined by the <i>PCI Specification</i> .  |
| PCI Express             | A scalable full-simplex serial bus standard that operates at 2.5 Gbps and offers both asynchronous and isochronous data transfers. Also known as PCIe.  |

|                                    |   |
|------------------------------------|---|
| PCI Express switch                 | <p>The PCI Express Base Specification defines a PCI Express switch as a logical collection of PCI Express-to-PCI Express bridge devices. On the NI PCIe-8371, the upstream port of the switch is connected to the PCI Express x4 card edge connector, and the downstream port is connected to a cabled MXI-Express x4 connector. On the NI PCIe-8372, the upstream port of the switch is connected to the PCI Express x4 card edge connector, and the two downstream ports are connected to the two cabled MXI-Express x4 connectors.</p> <p>On the NI PXIe-8370, the upstream part of the switch is connected to the cable. One downstream port is connected to the SMBus Master, and either four x4 ports or two x8 ports are connected to the backplane, depending on the chassis backplane configuration.</p> |
| PCI Express x4 card edge connector | The card edge connector allows you to use the NI PCIe-8371/8372 in a x4 or wider PCI Express slot in a PC. The PCI Express Card Electromechanical Specification defines this connector.   |
| PCI Express-to-PCI Bridge          | The PCI Express Base Specification defines a PCI Express-to-PCI bridge as a device that connects a PCI Express fabric and a PCI hierarchy. On the NI PXIe-8370, the PCI Express-to-PCI bridge connects the x4 PCI Express link and an SMBus Master on the card.   |
| PCI-PCI bridge                     | a device that transparently expands the PCI bus on a computer motherboard to another bus segment in the same machine. The bridge expands the number of PCI expansion slots, but remains transparent to the end user.  |
| PCI Express-to-PCI bridge          | <p>The <i>PCI Express Base Specification</i> defines a PCI Express-to-PCI bridge as a device that connects a PCI Express fabric and a PCI hierarchy.</p> <p>A PCI Express-to-PCI bridge enables certain MXI-Express x4 products to interface with PCI or PXI slots.</p>   |
| ppm                                | Parts-per-million.  |
| PXI                                | PCI eXtensions for Instrumentation. PXI is an open specification that builds off the CompactPCI specification by adding instrumentation-specific features.  |

## R

|     |   |
|-----|---|
| RMS | Root mean squared. <i>See also</i> <a href="#">gRMS</a> . |
|-----|---|

## S

s Seconds.

**SMBus Master** The SMBus is a low-speed bus for reading and configuring devices outside the normal PCI Express mechanism. The PXI Express specification requires controllers to supply an SMBus for reading chassis configuration information from an EEPROM. It may also be used for fan control, power monitors, or other system devices. In addition, devices on plug-in boards may connect to the SMBus for purposes specific to those devices.

## T

**target board** The MXI-Express x4 board of a cabled pair of boards that is farther from the CPU.

**trigger** Either TTL or ECL lines used for intermodule communication.

**TTL** Transistor-Transistor Logic.

## U

**USB** Universal Serial Bus—a serial bus for connecting computers to keyboards, printers, and other peripheral devices.

## V

V Volts.

**VISA** Virtual Instrument Software Architecture. This is the general name given to VISA and its associated architecture.

$V_{pp}$  Peak-to-peak voltage.

## **W**

W Watts.

## **X**

x1 A PCI Express link or port with one physical lane.

x4 A link or port with four physical lanes.

# Index

---

## B

- back side LEDs, 3-11
- basic MXI-Express x4, system, 1-5
- block diagrams, 1-3
- bracket, low-profile, 3-3

## C

- cabling, 3-7
- calibration certificate (NI resources), D-2
- cleaning, C-3, C-6
- common questions, A-1
  - general hardware, A-1
  - general software, A-3
  - MXI-3 to MXI-Express x4, A-2
- configuration, 2-1, 3-1
  - additional, star (figure), 1-6
  - basic, 1-5
  - software, 3-12
  - system, 3-12
- connecting
  - additional expansion chassis to a system, 2-3
  - PC or laptop to an expansion chassis, 2-2
- conventions used in the manual, *viii*

## D

- Declaration of Conformity (NI resources), D-2
- diagnostic tools (NI resources), D-1
- documentation
  - conventions used in manual, *viii*
  - NI resources, D-1
  - related documentation, *vii*
- drivers (NI resources), D-1

## E

- environment specifications
  - legacy
    - NI PCIe-8371, C-2
    - NI PCIe-8372, C-6
  - NI PCIe-8371, B-3
  - NI PCIe-8372, B-6
  - NI PXIe-8370, B-10
  - NI PXIe-8374, B-14
- examples (NI resources), D-1

## G

- getting started, 2-1

## H

- hardware, common questions, A-1
- help, technical support, D-1

## I

- installation, 3-1
  - cabling, 3-7
  - configuration, 3-12
  - hardware, 3-2
  - low-profile bracket, 3-3
  - NI PCIe-8371/8372, 3-2
  - NI PXIe-8370/8374, 3-5
  - powering down the MXI-Express x4 system, 3-8
  - powering up the MXI-Express x4 system, 3-7
  - software, 3-12
- instrument drivers (NI resources), D-1

## K

KnowledgeBase, D-1

## L

larger MXI-Express x4 systems, 1-6

LED

- indicators, 3-9

- locations, 3-10, 3-11

- status descriptions, 3-9

legacy specifications

- NI PCIe-8371, C-2

- NI PCIe-8372, C-5

low-profile bracket, 3-3

## M

Maximum, B-3, B-10, B-14

MXI-3 to MXI-Express x4 common  
questions, A-2

MXI-Express x4

- basic system, 1-5

- block diagrams, 1-3

- cabling, 3-7

- configuration, 3-1

- description and features, 1-1

- hardware overview, 2-1

- installation, 3-1

- larger systems, 1-6

- legacy specifications, C-1

- specifications, B-1

  - NI PCIe-8371, B-2

  - NI PCIe-8372, B-6

  - NI PXIe-8370, B-10

  - NI PXIe-8374, B-14

- terminology, 2-1

- unpacking, 3-1

## N

National Instruments support and  
services, D-1

NI PCIe-8371

- installation, 3-2

  - figure, 3-3

- installing the low-profile bracket, 3-3

- legacy specifications, C-5

- specifications, B-2

NI PCIe-8372

- installation, 3-2

  - figure, 3-3

- legacy specifications, C-2

- specifications, B-6

NI PXIe-8370

- installation, 3-5

  - figure, 3-6

- specifications, B-10

NI PXIe-8374

- installation, 3-5

- specifications, B-10

## O

overview, functional, 1-2

## P

physical specifications

- legacy

  - NI PCIe-8371, C-2

  - NI PCIe-8372, C-5

- NI PCIe-8371, B-2

- NI PCIe-8372, B-6

- NI PXIe-8370, B-10, B-14

programming examples (NI resources), D-1

**R**

related documentation, *vii*

**S**

safety specifications, C-3, C-6

software

common questions, A-3

configuration, 3-12

NI resources, D-1

specifications, B-1

environmental

legacy

NI PCIe-8371, C-2

NI PCIe-8372, C-6

NI PCIe-8371, B-3

NI PCIe-8372, B-6

NI PXIe-8370, B-10

NI PXIe-8374, B-14

legacy, C-1

physical

legacy

NI PCIe-8371, C-2

NI PCIe-8372, C-5

NI PCIe-8371, B-2

NI PCIe-8372, B-6

NI PXIe-8370, B-10

NI PXIe-8374, B-14

power

legacy

NI PCIe-8371, C-2

NI PCIe-8372, C-5

NI PCIe-8371, B-2

NI PCIe-8372, B-6

NI PXIe-8370, B-10

NI PXIe-8374, B-14

support, technical, D-1

system configuration, 3-12

**T**

technical support, D-1

training and certification (NI resources), D-1

troubleshooting (NI resources), D-1

**U**

unpacking, 3-1

**W**

Web resources, D-1

WEEE notification, C-4, C-8